



1-Port Gigabit Ethernet Half-Height Line Card Overview

This chapter describes the Cisco 10000 series 1-port Gigabit Ethernet half-height line card (referred to as the 1-port Gigabit Ethernet half-height line card), and contains the following sections:

- [Line Card Summary, page 10-1](#)
- [Software and Hardware Compatibility, page 10-3](#)
- [Line Card, Router, and Processor Compatibility, page 10-3](#)
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Line Card Summary

Table 10-1 *1-Port Gigabit Ethernet Half-Height Line Card Summary*

Product Number	Description	Minimum Cisco IOS Release
ESR-HH-1GE=	1-Port Gigabit Ethernet line card	Initial Cisco IOS releases for PRE-1: 12.0(23)S and later releases of Cisco IOS 12.0S Initial Cisco IOS releases for PRE-2: 12.2(15)BX and later releases of Cisco IOS 12.2BX 12.2(28)SB and later releases of Cisco IOS Release 12.2SB 12.3(7)XI and later releases of Cisco IOS 12.3 XI Initial Cisco IOS releases for PRE-3: 12.2(31)SB2 and later releases of 12.2SB2 For registered Cisco.com users, use Software Advisor to determine the software releases for this line card.
ESR-HH-CARRIER=	Full-length base carrier for half-slot line card	—

Table 10-1 1-Port Gigabit Ethernet Half-Height Line Card Summary(continued)

Product Number	Description	Minimum Cisco IOS Release
ESR-HH-COVER=	Blank filler for half-height line cards	—
SFP-GE-T=	1000BASE-T pluggable transceiver for Category 5 copper wire	12.2(31)SB6 and later releases of Cisco IOS 12.2SB6
SFP-GE-S= (previously GLC-SX-MM=)	1000BASE-SX pluggable transceiver	—
SFP-GE-L= (previously GLC-LH-SM=)	1000BASE-LX pluggable transceiver	—
GLC-ZX-SM= (previously ESR-SFP-ZX=)	1000BASE-ZX pluggable transceiver	—
CWDM-SFP-1470	Longwave 1470 nm laser, single mode Color: Gray	12.2(28)SB1 and later releases of Cisco IOS 12.2SB
CWDM-SFP-1490	Longwave 1490 nm laser, single mode Color: Violet	12.2(28)SB1 and later releases of Cisco IOS 12.2SB
CWDM-SFP-1510	Longwave 1510 nm laser, single mode Color Identifier: Blue	12.2(28)SB1 and later releases of Cisco IOS 12.2SB
CWDM-SFP-1530	Longwave 1530 nm laser, single mode Color Identifier: Green	12.2(28)SB1 and later releases of Cisco IOS 12.2SB
CWDM-SFP-1550	Longwave 1550 nm laser, single mode Color Identifier: Yellow	12.2(28)SB1 and later releases of Cisco IOS 12.2SB
CWDM-SFP-1570	Longwave 1570 nm laser, single mode Color Identifier: Orange	12.2(28)SB1 and later releases of Cisco IOS 12.2SB
CWDM-SFP-1590	Longwave 1590 nm laser, single mode Color Identifier: Red	12.2(28)SB1 and later releases of Cisco IOS 12.2SB
CWDM-SFP-1610	Longwave 1610 nm laser, single mode Color Identifier: Brown	12.2(28)SB1 and later releases of Cisco IOS 12.2SB

The 1-port Gigabit Ethernet half-height line card:

- Contains one Gigabit Ethernet port that provides a trunk uplink to switches and core routers
- Provides the Cisco 10000 series with an IEEE 802.3z-compliant Ethernet interface that can run up to 1 Gbps in full duplex mode.

**Note**

Bandwidth can reach a theoretical maximum of 711 Mbps due to backplane limitations of the PRE-1 (Part Number ESR-PRE1). The backplane bandwidth is not a limitation when using the PRE-2 (Part Number ESR-PRE2) or future PREs.

You install this line card in a Cisco 10000 chassis half-height slot carrier, which you must first install in the Cisco 10000 chassis slot. You can run this line card with a second line card in the other subslot.

The line card uses a small form-factor pluggable (SFP) module that supports a variety of Gigabit Ethernet interface types (SX, LX/LH, ZX, BASET, and CWDM), which you can change or upgrade at any time.

For more information about Coarse Wave Division Multiplexer (CWDM) Small Form-Factor Pluggable (SFP) laser optical transceiver modules, see the [Cisco CWDM GBIC and CWDM SFP Installation Note](#) at:

http://www.cisco.com/univercd/cc/td/doc/product/gbic_sfp/gbic_doc/78_15222.htm

**Note**

Only SFP modules purchased from Cisco work with the Gigabit Ethernet line card software.

**Note**

For the longwave 1470 nm laser SFP module (CWDM-SFP-1470=), use a long reach single-mode cable or an attenuator with a short reach cable.

If you are a registered Cisco.com user, see [Feature Navigator](#) for supported features.

Software and Hardware Compatibility

To check the minimum software requirements of Cisco IOS software for the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether line cards within a system are compatible, but provides the minimum Cisco IOS requirements for individual hardware line cards, modules, or options.

**Note**

Access to this tool is limited to users with Cisco.com login accounts.

To access [Software Advisor](#), go to Cisco.com and click **Login**, type **Software Advisor** in the Search box, and click **Go**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

Line Card, Router, and Processor Compatibility

[Table 10-2](#) lists router model, line card, and processor compatibility.

Table 10-2 *Line Card, Router, and Processor Compatibility*

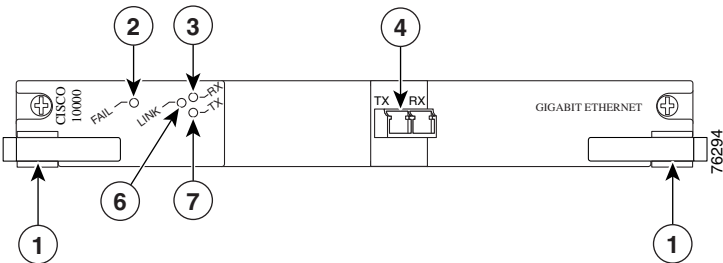
Line Card	Cisco 10008	Cisco 10005	PRE-3	PRE-2	PRE-1 ¹	PRE
1-port Gigabit Ethernet half-height line card	Yes	Yes	Yes	Yes	Yes	No

- Using the 1-port Gigabit Ethernet half-height line card with the PRE-1 is not recommended because of the bandwidth limitations on the PRE-1. Line rate speed is not achievable with the configuration of the 1-port Gigabit Ethernet half-height line card and PRE-1.

LEDs

The 1-port Gigabit Ethernet half-height line card LEDs are listed in [Figure 10-1](#).

Figure 10-1 1-Port Gigabit Ethernet Half-Height Line Card Faceplate Description



1	Ejector levers	4	SFP module port (TX/RX)
2	FAIL LED	6	LINK LED
3	RX (receive) LED	7	TX (transmit) LED

[Table 10-3](#) provides a description of the 1-port Gigabit Ethernet half-height line card LEDs.

Table 10-3 LED Description

LED Label	Color	State	Meaning
FAIL	Yellow	Off	Off when line card is working properly. Turns on for a few seconds during line card power-on self test (POST), then turns off.
		Blinking	The FAIL LED blinks during the following SFP module faults: <ul style="list-style-type: none">An SFP module other than a Cisco brand is inserted.A non-Gigabit Ethernet SFP module is inserted.A hardware problem occurs in a valid SFP module.
		On	The FAIL LED may blink in different patterns for certain POST failures (slot ID parity error and BPE loopback test failure). If the line card POST fails. If any failure occurs.
RX (receive)	Green	On	The port is receiving traffic.
		Off	The port is not receiving traffic.
TX (transmit)	Green	On	The port is transmitting traffic.
		Off	The port is not transmitting traffic.

Table 10-3 LED Description(continued)

LED Label	Color	State	Meaning
LINK	Green	On	Carrier detected; the port is able to pass traffic. This LED can also be on if the line card is in internal loopback.
		Off	No carrier signal is detected; the negotiation failed, or the port is administratively down.

**Note**

Because this line card operates in full-duplex mode, both the RX and TX LEDs can be on at the same time.

Physical Specifications

The 1-port Gigabit Ethernet half-height line card physical specifications appear in [Table 10-4](#).

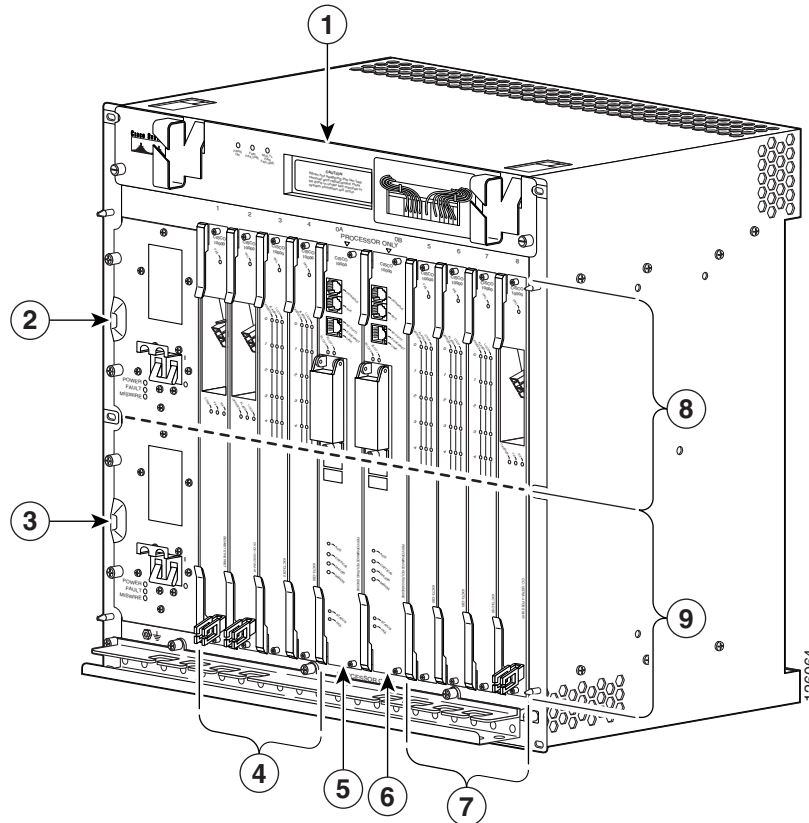
Table 10-4 1-Port Gigabit Ethernet Half-Height Line Card Physical Specifications

Description	Specifications
Physical dimensions	Height:7.8 in. (19.8 cm) Depth:11 in. (27.9 cm) Width: 1.3 in. (3.3 cm)
Shipping weight	Approximately 2 lb (0.9kg)
Operating temperature	41°F to 104°F (5°C to 40°C) Short-term operating temperature is limited to 131°F (55°C) in compliance with Bellcore GR
Relative humidity	Operating—nominal: 5% to 85% Operating—short term: 5% to 90% Storage: 5% to 95%
Storage temperature	–40°F to 158°F (–40°C to 70C °)

Slot Locations

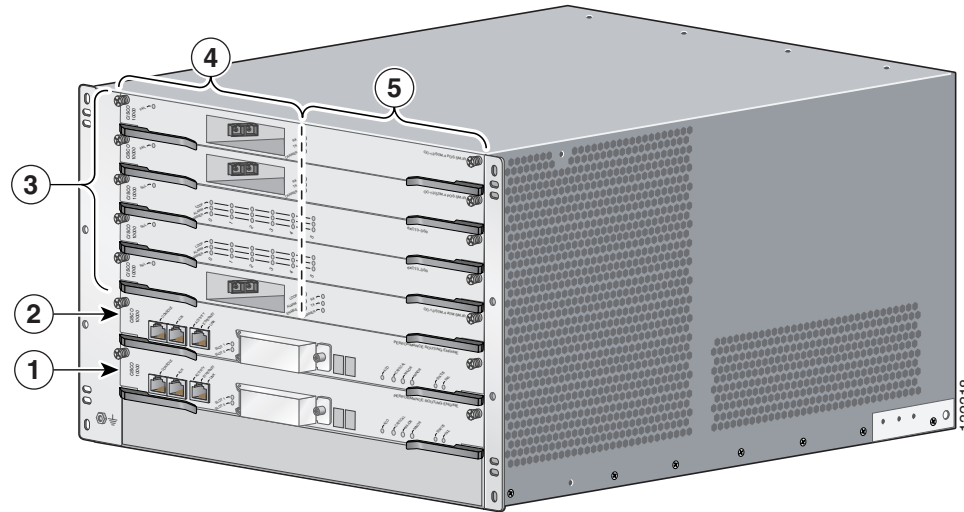
The line card slot designations are shown in this section. [Figure 10-2](#) shows line card slot designations for the Cisco 10008 router and [Figure 10-3](#) shows line card slot designations for the Cisco 10005 router.

Figure 10-2 Line Card Slot and Subslot Designations for the Cisco 10008 Router



1	Blower module	6	PRE slot B
2	Primary PEM	7	Line card slots 5 to 8
3	Redundant PEM	8	Subslot 0
4	Line card slots 1 to 4	9	Subslot 1
5	PRE slot A		

The 1-port Gigabit Ethernet half-height line card can be installed in subslot 0 or subslot 1 of the line card slot 1 through slot 8. The Cisco 10000 Carrier is used with the 1-Port Gigabit Ethernet Half Height line card.

Figure 10-3 Line Card Slot and Subslot Designations for the Cisco 10005 Router

1	PRE slot A	4	Subslots 1/0 (top) to 5/0 (bottom)
2	PRE slot B	5	Subslots 1/1 (top) to 5/1 (bottom)
3	Line card slots 1 (top) to 5 (bottom)		

The 1-port Gigabit Ethernet half-height line card can be installed in any subslot in line card slot 1 through slot 5. The Cisco 10000 Carrier is used with the 1-port Gigabit Ethernet half-height line card.

Cables and Connectors

The 1-port Gigabit Ethernet half-height line card supports single Ethernet interfaces based on SFP technology. The following SFP modules are supported by this line card:

- 1000BASE-SX SFP—The SFP-GE-S=, 1000BASE-SX SFP module operates on ordinary multimode fiber-optic link spans of up to 550 meters in length.
- 1000BASE-LX/LH SFP—The SFP-GE-L=, 1000BASE-LX/LH SFP module operates on ordinary single-mode fiber-optic link spans of up to 10,000 meters in length.
- 1000BASE-ZX SFP—The GLC-ZX-SM=, 1000BASE-ZX SFP module operates on ordinary single mode fiber-optic link spans of up to 70 kilometers in length. Link spans of up to 100 km are possible using premium single-mode fiber or dispersion-shifted single-mode fiber. The SFP module provides an optical link budget of 23 dB—the precise link span length depends on multiple factors such as fiber quality, number of splices, and connectors.
- 1000BASE-T SFP—The SFP-GE-T (1000BASE-T copper SFP module) provides full-duplex Gigabit Ethernet connectivity to high-end workstations and between wiring closets over an existing copper network infrastructure. The SFP-GE-T maximum cabling distance is 328 feet (100 m).

The Coarse Wave Division Multiplexer (CWDM) Small Form-Factor Pluggables (SFPs) are hot-swappable, laser optical transceiver modules. You can plug these SFPs into standard receptacles in Cisco routers and switches to convert Gigabit Ethernet electrical signals into a single-mode fiber-optic (SMF) interface. The router supports the following CWDM SFPs:

- CWDM-SFP-1470 SFP—Longwave 1470 nm laser, single mode
- CWDM-SFP-1490 SFP—Longwave 1490 nm laser, single mode
- CWDM-SFP-1510 SFP—Longwave 1510 nm laser, single mode
- CWDM-SFP-1530 SFP—Longwave 1530 nm laser, single mode
- CWDM-SFP-1550 SFP—Longwave 1550 nm laser, single mode
- CWDM-SFP-1570 SFP—Longwave 1570 nm laser, single mode
- CWDM-SFP-1590 SFP—Longwave 1590 nm laser, single mode
- CWDM-SFP-1610 SFP—Longwave 1610 nm laser, single mode

You can connect the CWDM SFPs to CWDM passive optical system optical add/drop multiplexer (OADM) or multiplexer/demultiplexer plug-in modules using single-mode fiber-optic cables with standard LC connectors. For more information, see the *Cisco CWDM GBIC and CWDM SFP Installation Note* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/gbic_sfp/gbic_doc/78_15222.htm

When shorter distances of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver. A 5-decibel (dB) or 10-dB inline optical attenuator should be inserted between the fiber-optic cable plant and the receiving port on the GLC-ZX-SM= at each end of the link whenever the fiber-optic cable span is less than 25 km. CWDM SFPs require a minimum of 12-dB optical attenuation. If the fiber itself is not providing the attenuation, then an attenuator device is required.

**Note**

The required line card SFP module is shipped installed in the line card. Cisco sells individual SFP modules separately and you can change the type of Gigabit Ethernet interface supported by this line card by changing its SFP module.

Use these guidelines for installing SFP modules:

- There is no correlation of the type of latch to the model (such as SX or LH) or technology type (such as Gigabit Ethernet) of SFP modules. Always read the label on the SFP module to determine the technology type and model.
- You can install and remove SFP modules with power on to the system.
- Disconnect all cables before removing or installing an SFP module. We strongly recommend that you do *not* install or remove the SFP module with optical fiber cables attached to it.
- SFP modules are keyed to prevent incorrect insertion.

SFP Module Configurations and Specifications

Table 10-5 lists the SFP configurations.

Table 10-5 SFP Configurations

Product ID	Type
SFP-GE-S=	Short wavelength (1000BASE-SX)
SFP-GE-L=	Long wavelength/long haul (1000BASE-LX)
SFP-GE-T=	RJ-45 copper SFP module (1000BASE-T)

Table 10-6 lists the SFP physical specifications.

Table 10-6 SFP Specifications

Specification	Description
Optical SFP module dimensions	Height: 0.33 in. (8.5 mm) Width: 2.22 in. (56.5 mm) Depth: 0.53 in. (13.4 mm)
Optical connectors	Multimode fiber-optic: LC Single-mode fiber-optic: LC
RJ-45 (copper) SFP module maximum dimensions	Height: 0.55 in. (14.0 mm) Width: 0.54 in. (13.7 mm) Depth: 2.8 in. (71.1 mm)
RJ-45 (copper) SFP module connector	RJ-45

Table 10-7 lists the SFP port cabling specifications.

Table 10-7 SFP Port Cabling Specifications

SFP Module	Wavelength (nm)	Fiber Type	Core Size (microns)	Modal Bandwidth (MHz/km)	Cable Distance
1000BASE-T SFP-GE-T=	N/A	Copper	N/A	N/A	328 ft. (100 m)
1000BASE-SX SFP-GE-S= (previously GLC-SX-MM=)	850	MMF	62.5 62.5 50.0 50.0	160 200 400 500	722 ft (220 m) 902 ft (275 m) 1640 ft (500 m) 1804 ft (550 m)
1000BASE-LX/LH SFP-GE-L= (previously GLC-LH-SM=)	1300	MMF ¹ SMF	62.5 50.0 50.0 9/10	500 400 500 —	1804 ft (550 m) 1804 ft (550 m) 1804 ft (550 m) 6.2 miles (10 km)

Table 10-7 SFP Port Cabling Specifications (continued)

SFP Module	Wavelength (nm)	Fiber Type	Core Size (microns)	Modal Bandwidth (MHz/km)	Cable Distance
1000BASE-ZX GLC-ZX-SM=)	1550	SMF	9/10	—	43.5 miles (70 km)
		SMF ²	8	—	62.1 miles (100 km)
CWDM-SFP-####=	1470 through 1610	SMF	—	—	—

1. A mode-conditioning patch cord is required. Using an ordinary patch cord with MMF, 1000BASE-LX/LH SFP modules, and a short link distance (tens of meters) can cause transceiver saturation resulting in an elevated bit error rate (BER). In addition, when using the LX/LH SFP module with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and receive ends of the link. The mode-conditioning patch cord is required for link distances greater than 984 ft (300 m).
2. Dispersion-shifted single-mode fiber-optic cable.

Table 10-8 provides SFP module power budget information.

Table 10-8 Gigabit Ethernet SFP Transmit Power, Receive Power, and Power Budget

SFP Module	Transmit Power		Receive Power		Power Budget
	Minimum	Maximum	Minimum	Maximum	
SFP-GE-S=	−9.5 dBm ¹	−4 dBm ¹	−17 dBm	0 dBm	7.5 dBm ²
SFP-GE-L=	−9.5 dBm ³ −11.5dBm ⁴	−3 dBm ⁵	−20 dBm	−3 dBm	7.5 dBm ⁶ and 8.0 dBm ⁷
GLC-ZX-SM=	0 dBm	5 dBm	−23 dBm	0 dBm	−24 dBm
CWDM-SFP-####=	0 dBm	5 dBm	−28 dBm	−7 dBm	28 dB

1. For fiber types 50/125 μm , NA = 0.20 fiber and 62.5/125 μm , NA = 0.275 fiber.
2. For fiber types 50/125 μm MMF and 62.5/125 μm MMF.
3. For fiber types 9/125 μm SMF.
4. For fiber types 62.5/125 μm MMF and 50/125 μm MMF.
5. For fiber types 9/125 μm SMF, 62.5/125 μm MMF, and 50/125 μm MMF.
6. For fiber types 50/125 μm MMF and 62.5/125 μm MMF.
7. For fiber type 10 μm SMF.

Related Documentation

For related documentation on SFP modules, see the following publications:

- [Gigabit Interface Converter \(GBIC\) Module and Small Form-Factor Pluggable \(SFP\) GBIC Module Installation Information and Specifications](#)
- [Cisco SFP Optics for Gigabit Ethernet Applications Data Sheet](#)
- [Cisco 1000BASE-T SFP Data Sheet](#)

Mode-Conditioning Gigabit Ethernet Patch Cord Description

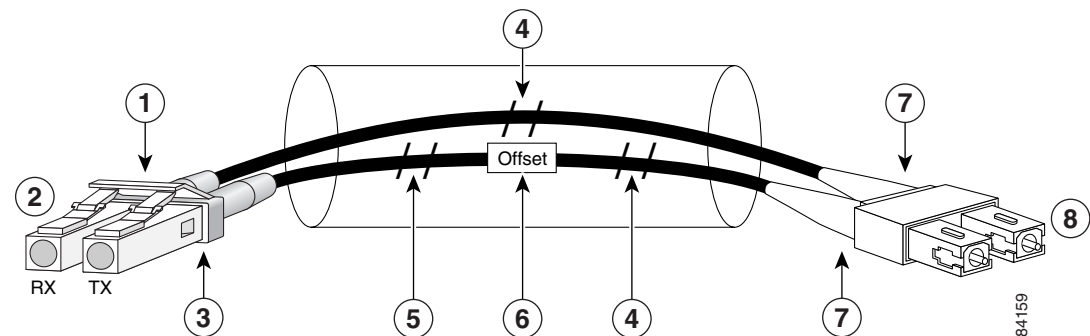
A mode-conditioning patch cord can be used with the SFP-GE-L= (SFP module) to allow reliable laser transmission between the single-mode laser source on the SFP module and a multimode optical fiber cable.

When an unconditioned laser source designed for operation on single-mode optical fiber is directly coupled to a multimode optical fiber cable, an effect known as *differential mode delay* (DMD) might result in a degradation of the modal bandwidth of the optical fiber cable.

This degradation results in a decrease in the link span (the distance between a transmitter and a receiver) that can be supported reliably. The effect of DMD can be overcome by conditioning the launch characteristics of a laser source. A practical means of performing this conditioning is to use a device called a mode-conditioning patch cord.

A mode-conditioning patch cord is an optical fiber cable assembly that consists of a pair of optical fibers terminated with connector hardware. Specifically, the mode-conditioning patch cord is composed of a single-mode optical fiber permanently coupled off-center (see Offset in [Figure 10-4](#)) to a graded-index multimode optical fiber. [Figure 10-4](#) shows a diagram of the mode-conditioning patch cord assembly.

Figure 10-4 Mode-Conditioning Patch Cord Assembly for an SFP Module



1	Gray color identifier	5	Single-mode bar
2	To Gigabit Ethernet interface	6	Offset
3	Blue color identifier	7	Beige color identifier
4	Multimode bar	8	To cable plant

The mode-conditioning patch cord assembly is composed of duplex optical fibers, including a single-mode-to-multimode offset launch fiber connected to the transmitter, and a second conventional graded-index multimode optical fiber connected to the receiver. The use of a plug-to-plug patch cord maximizes the power budget of multimode 1000BASE-LX and 1000BASE-LH links.

The mode-conditioning patch cord is required to comply with IEEE standards. The IEEE found that link distances could not be met with certain types of fiber-optic cable cores. The solution is to launch light from the laser at a precise offset from the center, which is accomplished by using the mode-conditioning patch cord. At the output of the patch cord, the SFP-GE-L= is compliant with the IEEE 802.3z standard for 1000BASE-LX.

Go to [Chapter 16, “Preparing for Installation”](#) to begin the installation or replacement of the line card. For troubleshooting information, see [Chapter 18, “Troubleshooting the Installation.”](#)

